SGMM

Smart Grid Maturity Model

A Zero-depth Entry to Using the TSP:

How TSP was used to turn around the SGMM project that was drowning in details

November 4, 2014

Report Documentation Page

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The Smart Grid Maturity Model is

A management tool

that provides a

common language and framework

for defining key elements of

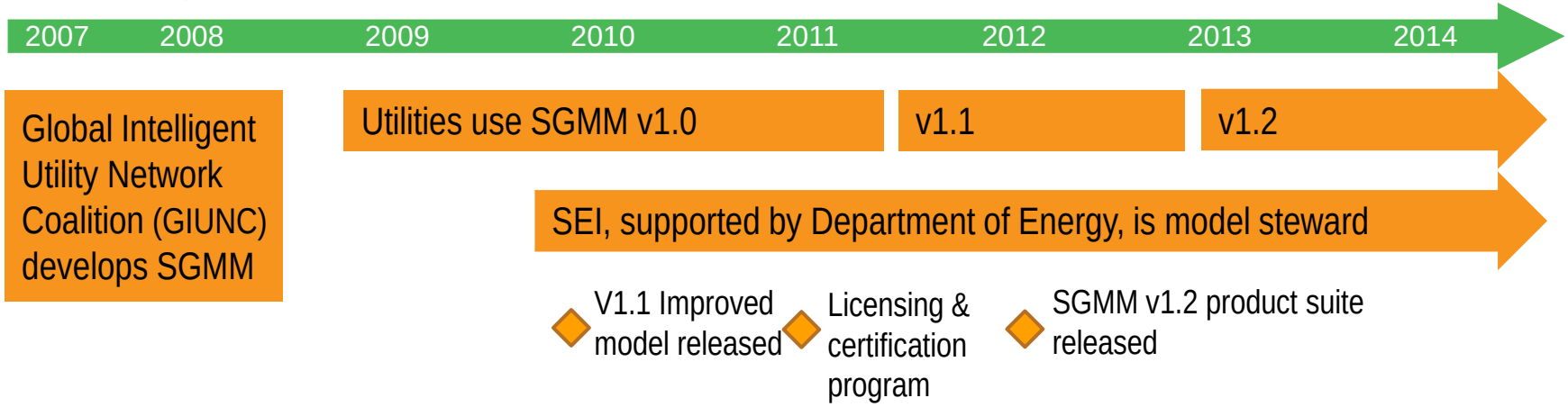
smart grid transformation

and helping utilities develop a

programmatic approach

and track their progress

Developed by Utilities for Utilities



SGMM

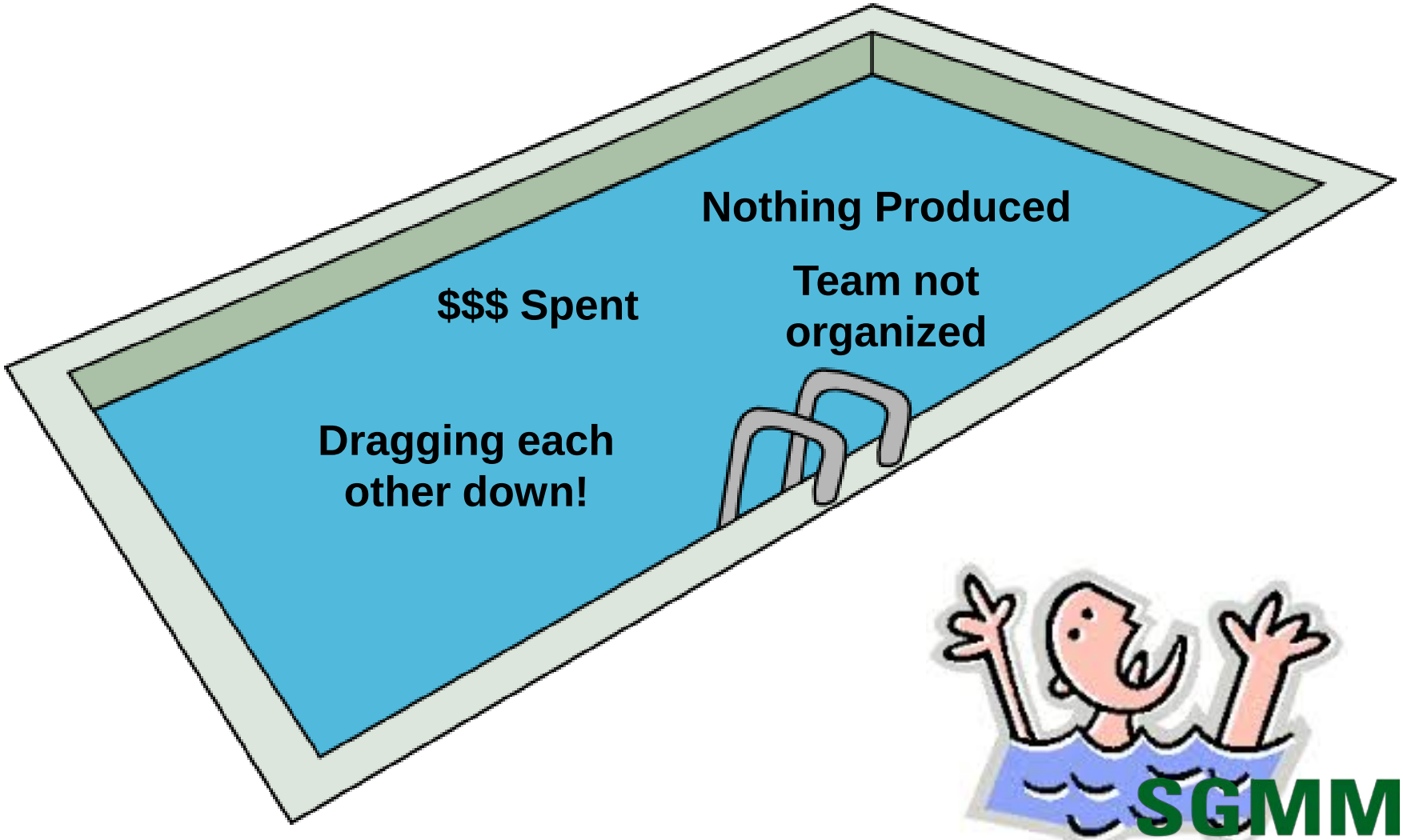
Smart Grid Maturity Model

V 1.2 Product Suite

Model	Fully described in the Model Definition document
Compass Survey	Questionnaire-based assessment yields maturity ratings and comparisons
Navigation Process	Expert-led workshops to complete Compass and use results to develop consensus aspirations
Training	Overview Seminar and SGMM Navigator Course
Partner Program	License organizations and certify individuals to deliver Navigation process

www.sei.cmu.edu/smartgrid

The Problem…



SGMM
Smart Grid Maturity Model
V 1.2 Product Suite

A Solution…

Photo: tripadvisor.com

TSP is not just for software

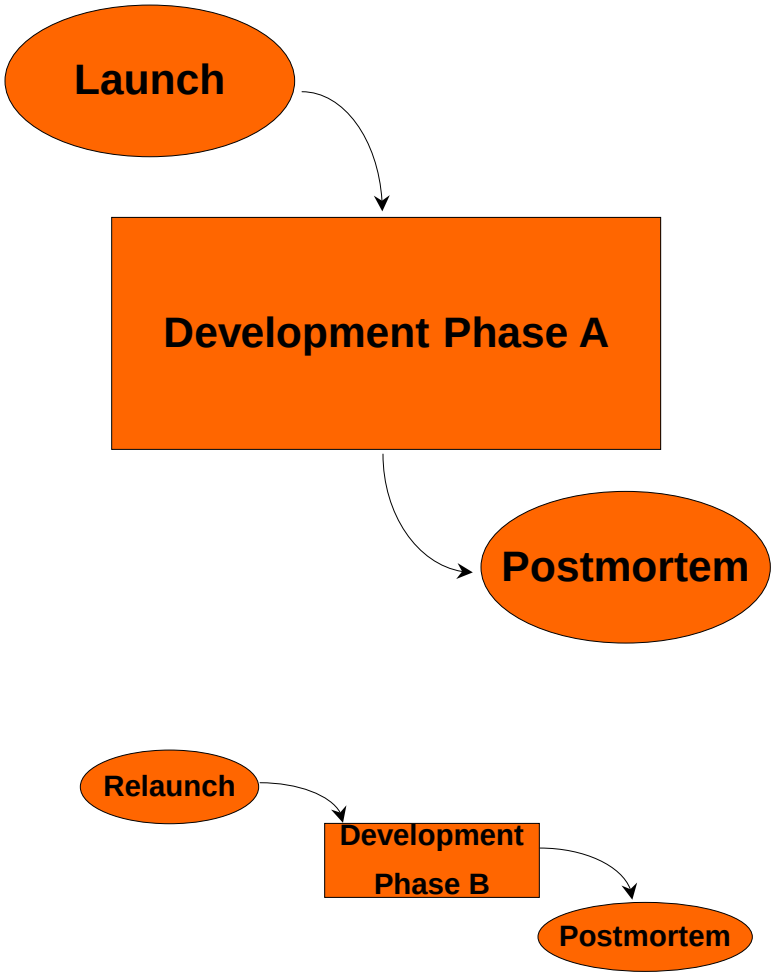
Initially we used TSP as a project management framework.

Later we used TSP to develop/evolve

- core product (model and survey)
- navigation and support processes
- training

Stayed true to the TSP principles.

- team building
- planning and post mortems
- design
- Implementation and testing
- support processes (CM, Inspections, etc.)



Team building

Team attributes:

- geographically distributed
- part-time on several projects
- specific skill sets
- never worked together
- a lot of personnel changes – consistent core team

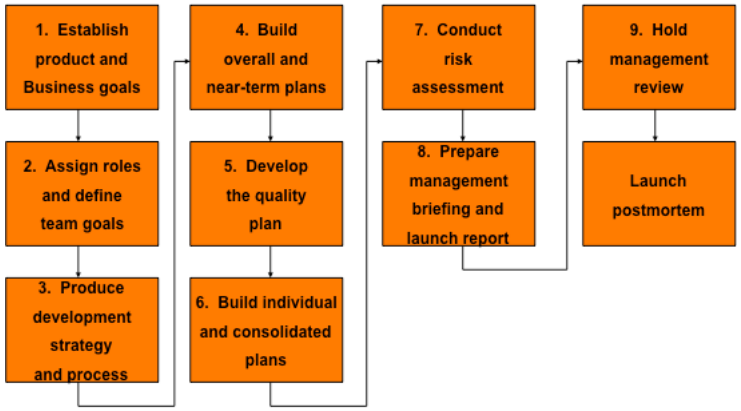
Launches and post-mortems were the primary team building activities.

Feedback from the launches

+ great team, energizing, missed old team members, great to have new team members, good meeting, great food
- ran out of time, doing math was BAD

Roles
Project manager
Model owner and architect
Course owner
Process owner
Program development and transition, DOE relationship manager
Licensing POC
Certification POC
Technical writer
Marketing and communications
Navigator
Instructor

Team launches



Launches were conducted following a standard launch agenda.

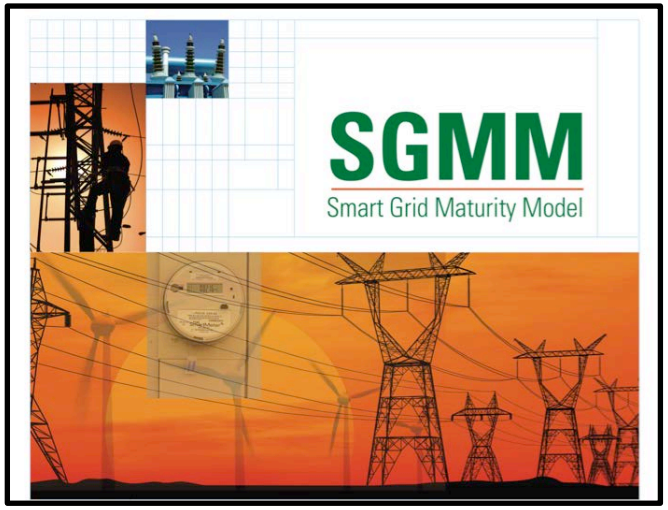
Our first agenda item for each launch was a review of project status (post mortem.)

Major differences the launch process were

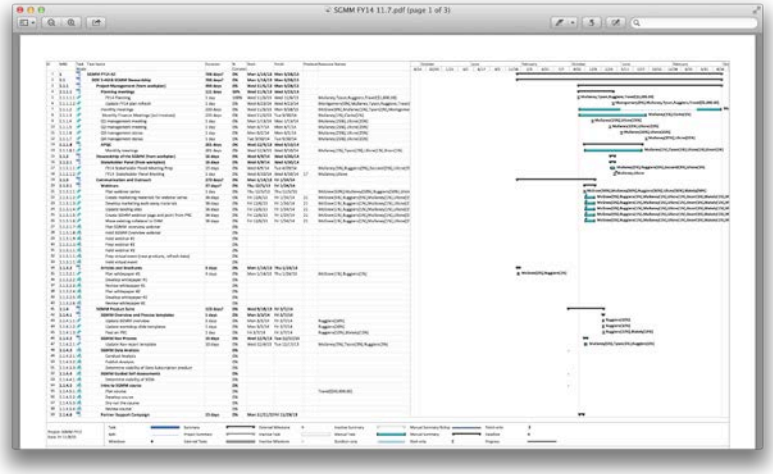
- team roles were functional
- used MS Project for planning and tracking tasks **and** costs
- used several cost planning tools
- quality planning improved as the product suite advanced

Note: Cost data was handled like defect data. Only aggregate cost data was shown at a team level.

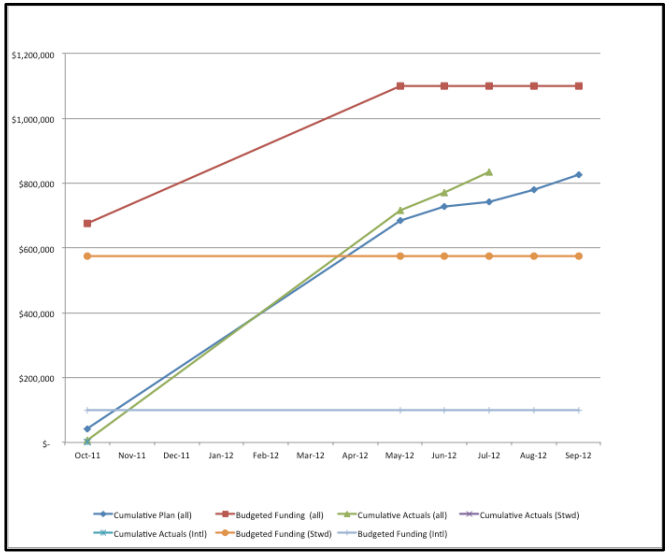
Launch artifacts



Meeting 9 Presentation



WBS with cost data



Funding Plan

Load balancing

For each team member, we calculated hours per month and compared that to percentage allocation.

Who Does What When as of Tue 4/27/10
100226 SGMM Mar10-Dec10 v3

	December	January	February	March	April	May	June	July	August
Rich Caralli					8.8 hrs	8 hrs	8.8 hrs	8.4 hrs	8.8 hrs
Rita Briston					8.8 hrs	8 hrs	8.8 hrs	8.4 hrs	8.8 hrs
David White				7.68 hrs	66 hrs	146 hrs	220.4 hrs	56.88 hrs	47.28 hrs
James Stevens					77.92 hrs	75.77 hrs	105.03 hrs	27.43 hrs	85.43 hrs
Barbara Tyson				14.4 hrs	108.88 hrs	107.37 hrs	125.52 hrs	21.28 hrs	47.2 hrs
Amanda Parente				53.2 hrs	7.52 hrs	168.4 hrs	36.17 hrs	3.37 hrs	9.92 hrs
Julia Mullaney				32 hrs	93.43 hrs	104.17 hrs	156.4 hrs	35.43 hrs	31.2 hrs
Austin Montgomery					35.12 hrs	22.23 hrs	85.77 hrs	5.03 hrs	28.17 hrs
Steve Masters					40.88 hrs	28.17 hrs	37.2 hrs	9.03 hrs	9.92 hrs
Howard Lipson					3.52 hrs	16.8 hrs	11.52 hrs	3.37 hrs	3.52 hrs
Ray Jones				8 hrs	104.08 hrs	51.37 hrs	125.28 hrs	25.43 hrs	81.92 hrs
James Ivers							8 hrs		
Mark Kasunik									
David Biber				18.4 hrs	17.6 hrs	24 hrs			
Chris (APQC)					40 hrs	104 hrs		8 hrs	
Austin (rate)					1.43 hrs	9.6 hrs	10.57 hrs	10.08 hrs	10.57 hrs
Summer Fowler					1.2 hrs	8 hrs	8.8 hrs	8.4 hrs	8.8 hrs
3.1 Project mgmt & control					1.2 hrs	8 hrs	8.8 hrs	8.4 hrs	8.8 hrs

Resource	Budget
Mullaney	33%
White	25%
Montgomery	7%
Tyson	20%
Jones	30%
Ruggiero	15%
McGraw	0%
Zaccardi	10%
Gress	5%
Fowler	5%

Budget analysis

We analyzed data from three different approached to finalize the plan.

	Month 1	Month 2	Month 3
Total FTE	0.56	0.56	0.56
Total Labor Cost	$ 17,025.35	$ 17,025.35	$ 17,025.35
Travel (Domestic)	$ 2,000.00	$ 2,000.00	$ 2,000.00
Travel (International)	$ -	$ -	$ -
Printing	$ -	$ -	$ -
Office Supplies	$ -	$ -	$ -
Shipping	$ -	$ -	$ -
Books & Periodicals	$ -	$ -	$ -
Capital Equipment	$ -	$ -	$ -
Non-Capital Equipment	$ -	$ -	$ -
Software (incl Maintenance and Licenses)	$ -	$ -	$ -
Subcontracting/Consulting services	$ 1,000.00	$ 1,000.00	$ 1,000.00
SEI Courses	$ -	$ -	$ -
CMU Courses	$ -	$ -	$ -
CMU Course materials	$ -	$ -	$ -
Ext. Course/conference registration	$ -	$ -	$ -
Total Non-Personnel Expenses (incl overheads)	$ 3,237.06	$ 3,237.06	$ 3,237.06
Total Monthly Cost	**$ 20,262.41**	**$ 20,262.41**	**$ 20,262.41**
TOTAL Project Cost	$ 243,148.97		

Resource	Budget
Mullaney	33%
White	25%
Montgomery	7%
Tyson	20%
Jones	30%
Ruggiero	15%
McGraw	0%
Zaccardi	10%
Gress	5%
Fowler	5%

WBS	Task Mode	Task Name	Duration	% Complete	Start	Finish	Cost
1		**SGMM FY12 All**	**285 days**	**89%**	**Mon 10/3/11**	**Mon 11/5/12**	**$320,565.28**
1.1		**DOE 5-461B SGMM Stewardship**	**285 days**	**90%**	**Mon 10/3/11**	**Mon 11/5/12**	**$264,488.40**
1.1.1		**Project Management (from workplan)**	**221 days**	**89%**	**Wed 12/7/11**	**Wed 10/10/12**	**$72,123.94**
1.1.1.1		**Quarterly Planning Meetings**	**186.5 days**	**99%**	**Wed 12/7/11**	**Thu 8/23/12**	**$34,432.36**
1.1.1.1.1		FY12 Planning	0 days	0%			$0.00
1.1.1.1.2		Q1 Planning	2 days	100%	Wed 12/7/11	Thu 12/8/11	$0.00
1.1.1.1.3		Q2 Planning	1 day	100%	Thu 1/12/12	Thu 1/12/12	$8,171.72
1.1.1.1.4		Q3 Planning	0.5 days	100%	Wed 4/25/12	Wed 4/25/12	$4,085.86
1.1.1.1.5		Q4 Planning	2.5 days	100%	Tue 8/21/12	Thu 8/23/12	$22,174.78
1.1.1.2		Weekly Team Meetings	194 days	93%	Tue 1/3/12	Fri 9/28/12	$19,568.08
1.1.1.3		Monthly Finance Meetings (incl invoices)	194 days	88%	Tue 1/3/12	Fri 9/28/12	$12,818.43
1.1.1.4		**Quarterly Reporting to DOE**	**220 days**	**75%**	**Thu 12/8/11**	**Wed 10/10/12**	**$0.00**
1.1.1.4.1		Q1 DOE Report	1 day	100%	Thu 12/8/11	Thu 12/8/11	$0.00
1.1.1.4.2		Q2 DOE Report	1 day	100%	Thu 3/8/12	Thu 3/8/12	$0.00
1.1.1.4.3		Q3 DOE Report	1 day	100%	Tue 7/10/12	Tue 7/10/12	$0.00
1.1.1.4.4		Q4 DOE Report	1 day	0%	Wed 10/10/12	Wed 10/10/12	$0.00

Launch – lessons learned

- Planning made project AND project team successful
- Team members were overcommitted, but SGMM work got done on time
- Insight into cost “elevated” everyone to a senior management role with ability to make more informed decisions
- Reconciliation of finances was monthly, but the team meetings enable course corrections weekly

Design – lessons learned

We developed designs for all SGMM artifacts including

- Navigation process
- Training
- Presentations
- Workshops and meetings
- Documents

We developed products plans for each product that defined product objectives, intended audience, and intended usage.

The following are examples of our design documents for various products.

Process design

Phase 2: Survey Workshop Workshop
In this step, the organization completes the SGMM assessment survey under the direction of the SGMM Navigator. This step is composed of five steps.

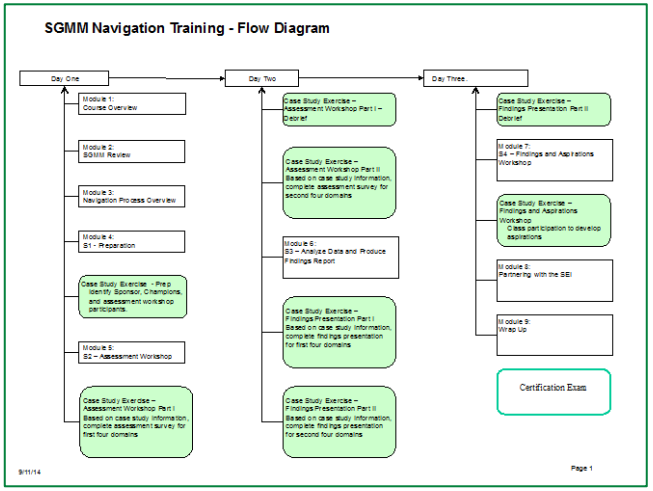
The sponsor kicks off the workshop and motivates the participants by explaining why this effort is important and describes the business objectives of the organization's grid modernization effort. The SGMM Navigator then provides an SGMM overview seminar to establish a common understanding and vocabulary of SGMM. The guidelines for completing the survey are discussed next and the survey is completed. The workshop ends with the SGMM Navigator thanking everyone for their efforts and describing the next steps.

Process Elements Needed

- assessment workshop script
- assessment workshop agenda template
- assessment presentation template
- assessment survey support tool

Process Element	Purpose	Type	Format	Size
Overall script	To guide the Navigator through the overall process	script	Word	1-2 pgs
Schedule template	Provides the timing of the major steps of the navigation process	template	Word	1 pg
Process Improvement Proposal form	Provide SEI with suggestion for improving the SGMM product suite	form	Word	1 pg
FAQs for Navigators and Users	To provide answers to common questions that navigators as well as users and potential user may have	FAQ	Word	1-2 pgs each
Role and responsibility Specification	To identify the key roles in the SGMM Navigation Process and detail their responsibilities	specification	Word	1-2 pgs
Sponsor kickoff meeting guidelines	To prepare the sponsor to kickoff the overall effort at the facilitated assessment workshop	guideline	Word	1 pg

Training/Workshops HLD



Component	Educational Objectives	SGMM Reference	Detail	Time Estimate (min)	Comments
Day 1					
Course Overview (Barbara)	• Get acquainted with the class • Students understand the course focus and why it is important to them. • Students know what to expect from the course and what is not covered.		• Introductions • Expectations • Course overview (schedule and agenda)	45	After the standard introduction and logistics, discuss challenges in working with electric utilities that are implementing smart grid. Introductions include background, experience with electric utilities and consulting with the utilities, The lecture ends with an overview of the class including the agenda. NOTE: need to save challenges so we can incorporate them into the course.
Review of the SGMM (Julia)	The students can describe • how the SGMM can support an electric utility. • how each of the components of the product suite is related to each other. • the 6 levels of the SGMM.	• SGMM MDD • Overview Seminar • Assessment Survey • Pre-test	• How the SGMM helps utilities implement smart grid? • Discuss components of the product suite • SGMM Architecture • What are the characteristics of the Levels and Domains?	45	Discuss with the class what the challenges are for utilities that are participating in modernizing the grid. The outcome of the discussion is common ground on what the smart grid is. The instructor presents how the SGMM supports modernizing the grid. The next topic is on the SGMM product suite (how they fit together) and the SGMM architecture. This leads to a discussion about what the levels are (note: have small group discussions before class discussion). Ask if there are any questions about the pre-test. NOTE: create 5 questions for certification exam.

Training Module/ Presentation DLD

Lecture or Module: Module 7: Findings and Aspirations Workshop
Course: SGMM Navigator Training
Developer: Barbara Tyson

Delivery Choice / Instructional Materials:	**Size:**	**Timing:**
Lecture / slides	Number of lecture slides: 17 Number of workbook pages: ??	Lecture: 45 minutes Exercises: 90 minutes

EDUCATIONAL OBJECTIVES:

Students

- Understand the purpose and outcomes of the Findings and Aspirations workshop
- Describe the navigator's role including design, facilitation, and follow-up

Transitional Flow

The instructor continues to walk the students through the steps of the navigation process. This module covers step 4 of the process, the findings and aspiration workshop. This module includes a lecture that describes the fourth step of the process and a class exercise to give the students practice conducting an aspirations identification session.

Learning Assessments

Ask the following kinds of questions on the certification exam (15%? questions should come from this section.) Potential questions include:

- TBD later

STORYBOARD (or at least a high level description)

Topics:

- **Findings and Aspirations Workshop Overview**
- **Presentation of Findings**
- **Identifying Aspirations**
  - **Review of Organization's Objectives**
  - **Identifying Gaps Between Objectives and Findings**
  - **Developing Aspirations Statements**
- **Identifying Next Steps and Workshop Closure**
- **After the Findings and Aspirations Workshop**
- **Aspirations Identification Exercise**

Findings and Aspirations Workshop Overview

Slide 1: Entry Criteria: The instructor will have the students open their resources notebook to the Findings and Aspirations Workshop tab. The slide will have a flow chart diagram of the five steps of the process. The instructor will provide a very quick overview of the process starting with the entry criteria. The instructor will note that each step will be discussed later in the lecture and that there will be an exercise simulating an identification of aspirations session. The instructor then has the students turn to the script.

Slide 2. Workshop Kickoff . The instructor explains the agenda template. The instructor will discuss the overall objectives of the workshop. It is important to discuss both the objectives related to the findings presentation and the identification of aspirations. The instructor leads a discussion on the importance of having the right people at the workshop. This is an opportunity for the sponsor to reinforce commitment to the process and restate the organization's business objectives.

Presentation of Findings

Slide 3. Review of the Findings Presentation Template. The instructor will quickly review the findings presentation template. The students should be very familiar with the template because they presented their "findings" in the previous exercise. However, if there are any lingering questions, they can be answered here.

Slide 4. . Presentation of Findings. The instructor will describe how the presentation of the findings will be conducted. The instructor will lead a discussion on possible interactions during the presentation of the findings. For example, there may be questions regarding how a particular finding was developed; or there may be disagreement with some findings.

Identifying Aspirations

Documents - HLD

SGMM Leadership Workshop Special Report – High-Level Design

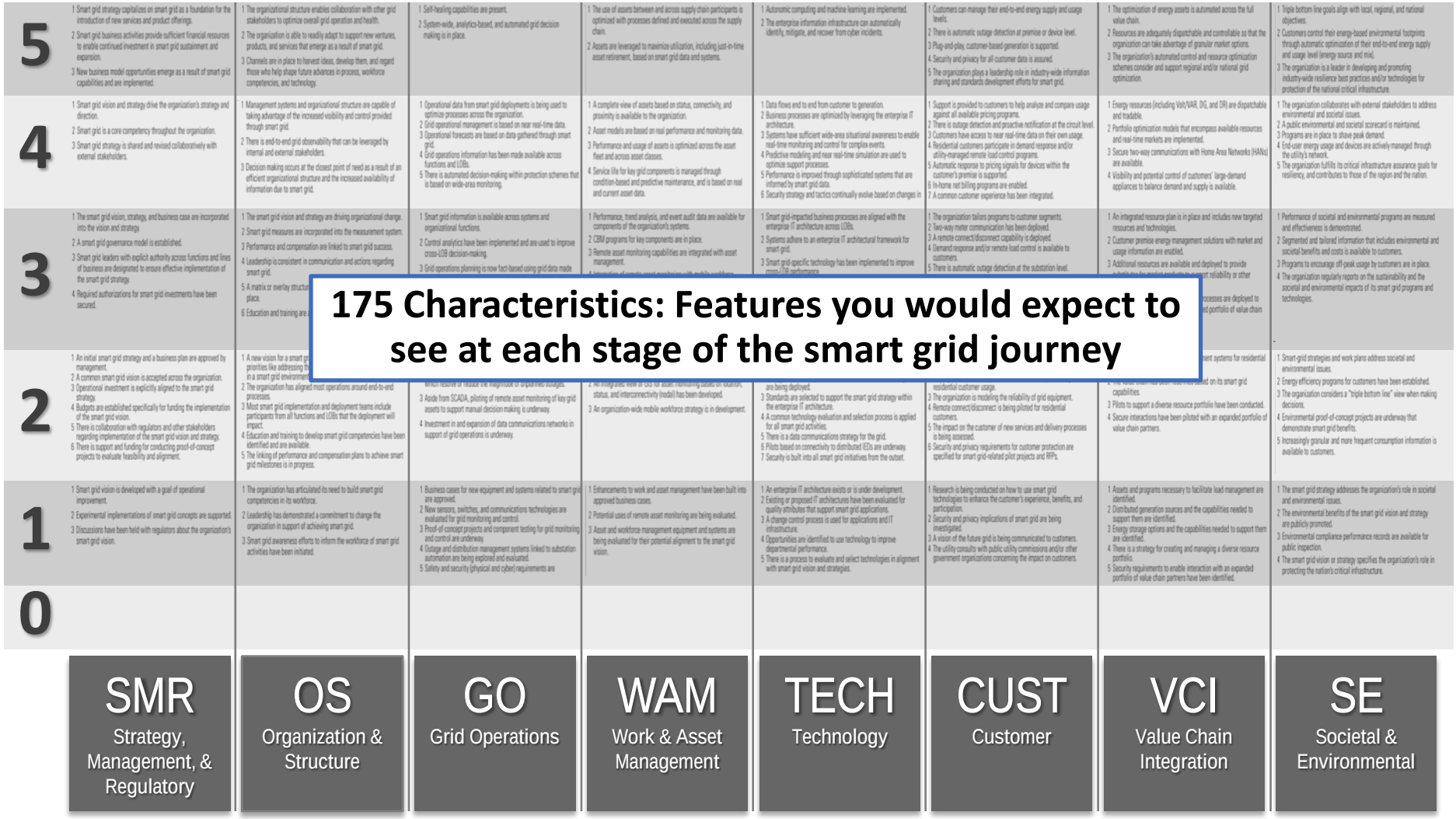
Component	Objectives	Reference (used by writer)	Detail	Size Est. (pgs)	Comments
Acknowledgements	Thank **Objectives:** participants **Objectives:** sponsor **Objectives:** workshop coordinators		One paragraph	1	We'll include TCS as a participant since they sent us input for the workshop.
Executive Summary	Not needed for this report.				The report will be highly organized and easy to navigate so we don't think we need an executive summary.
Abstract	Descriptive summary of the report		Not more than 200 words	.5	Abstracts are descriptive or informative. A descriptive abstract just summarizes the structure of report. A descriptive abstract does not draw conclusions or "sum up" the report or go into the content of the report.
Workshop Overview	Document the purpose of the workshop and how it was conducted.	Workshop **Objectives:** product plan **Objectives:** invitation emails **Objectives:** DLDs **Objectives:** overview slides	**Objectives:** Workshop Objectives **Objectives:** Workshop Participants (by name and company) **Objectives:** Workshop logistics (date, location, agenda) **Objectives:** Workshop style (brainstorming and consensus building)	2	
About This SR	Tell the reader **Objectives:** what is in the report (and what isn't in the report) **Objectives:** report structure (by topic, not agenda)			1	Write this section last.

Implementation

The following slides show the team accomplishments with what we produced.

SGMM at a glance

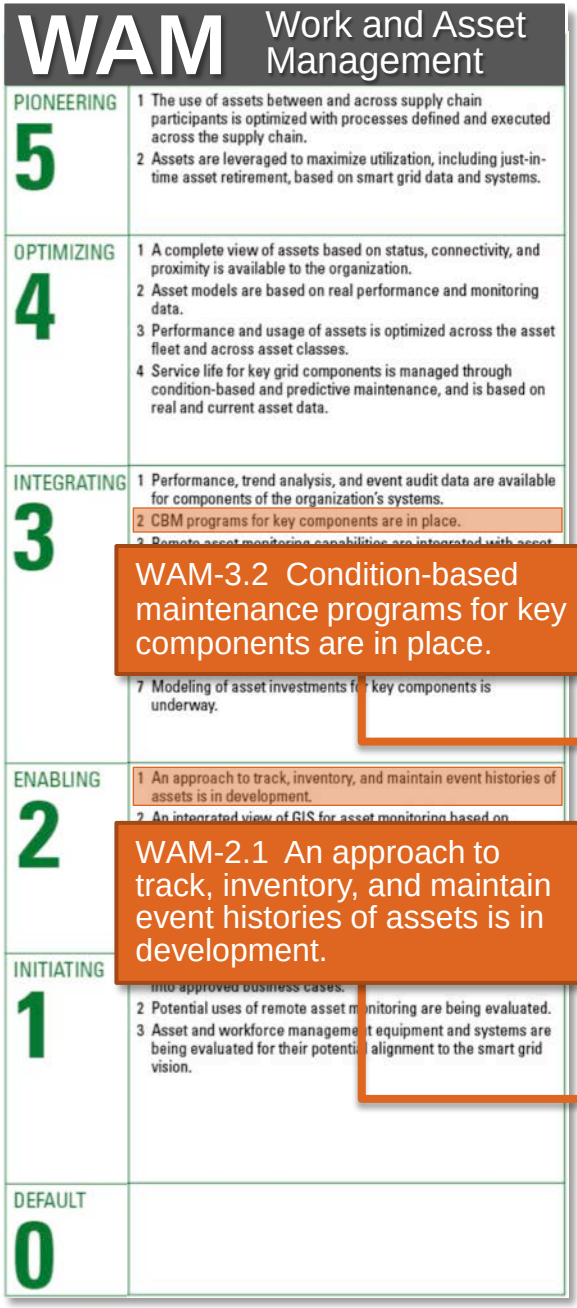
6 Maturity Levels: Defined sets of characteristics and outcomes



175 Characteristics: Features you would expect to see at each stage of the smart grid journey

8 Domains: Logical groupings of smart grid related characteristics

SGMM Compass Survey



Contains

- One question for each expected characteristic in the model and
- Attribute and performance questions

Example questions:

WAM-3.2 Condition-based maintenance programs for key components are in place.

WAM-2.1 An approach to track, inventory, and maintain event histories of assets is in development.

WAM-3.2 For what percentage of key components have you implemented condition-based maintenance that uses real-time data from asset monitoring to drive maintenance and replacement decisions?

A. 0%
B. 1 - 25%
C. 26 - 50%
D. 51 - 75%
E. 76 - 100%

WAM-2.1 Have you established an approach to track, inventory, and maintain event histories of assets using smart grid capabilities?

A. No
B. In documented plan including committed schedule and budget
C. In development
D. Being piloted
E. Completed

SGMM Navigation: five-phase, expert-led process

Stakeholders complete SGMM Compass survey

Discussion and consensus answers lead to internal alignment on current state

Stakeholders review survey findings & set aspirational profile

Consensus on aspirational state and identification of motivations, actions, and obstacles to achieve it

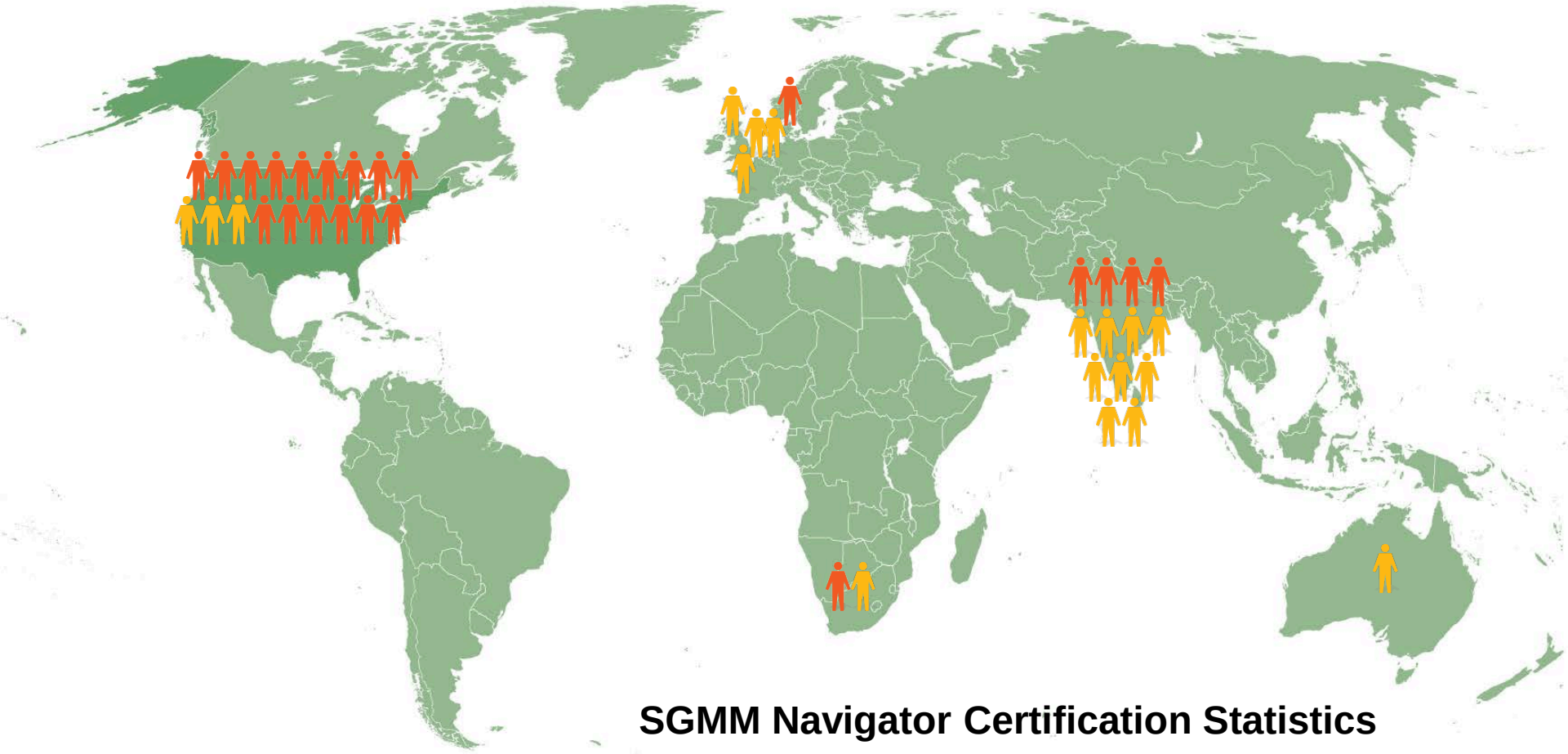
SGMM Partners

SGMM Partners are licensed by the SEI to provide official SGMM services, which are delivered by SEI-certified SGMM Navigators.

John F. Ryskowski Consulting

http://partners.clearmodel.com/partners

SGMM Navigator population

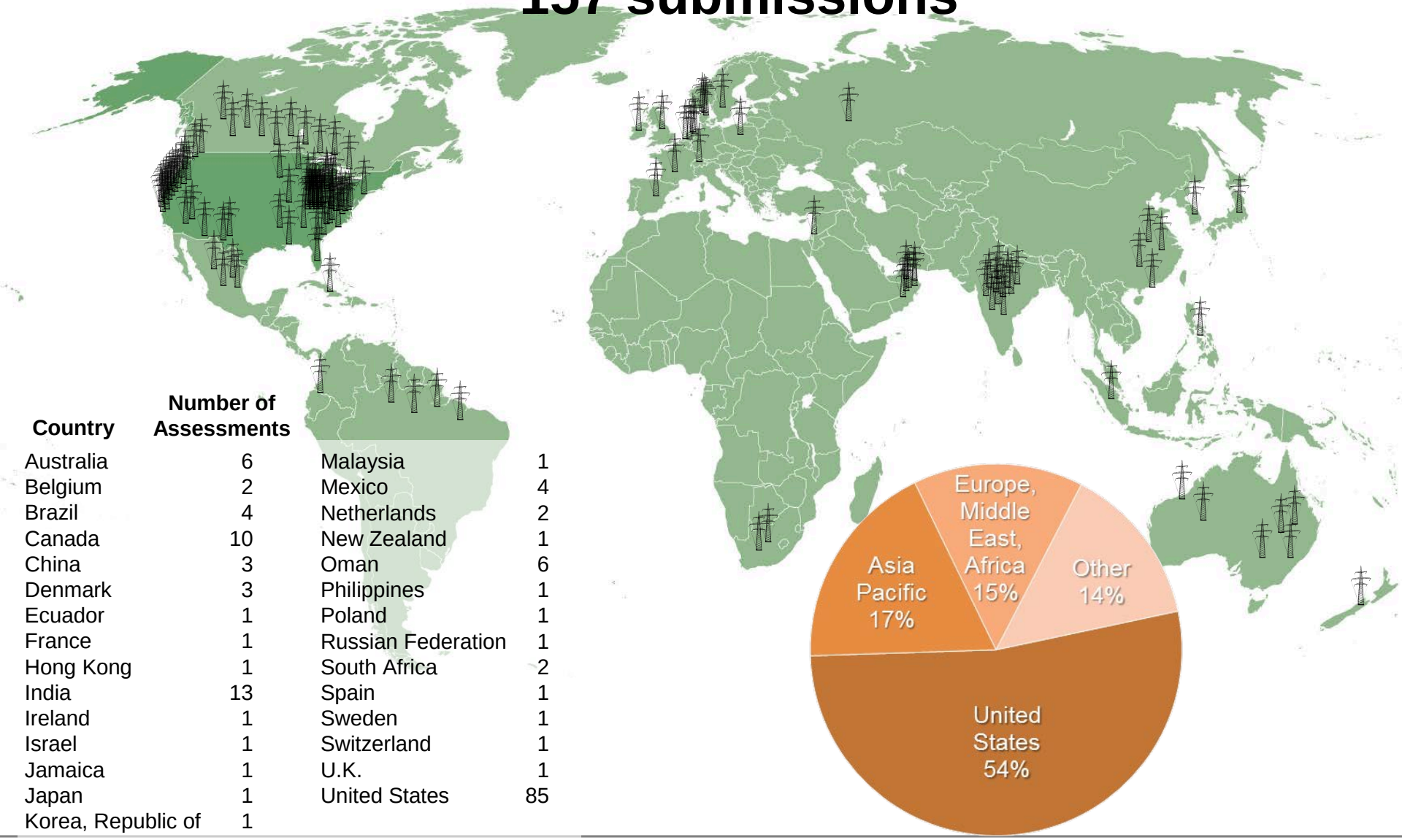


SGMM Navigator Certification Statistics

18 Candidate Navigators *(passed exam)*

18 Certified Navigators *(completed all requirements)*

SGMM History – 142 utilities, 29 countries, 157 submissions



Country	Number of Assessments	Country	Number of Assessments
Australia	6	Malaysia	1
Belgium	2	Mexico	4
Brazil	4	Netherlands	2
Canada	10	New Zealand	1
China	3	Oman	6
Denmark	3	Philippines	1
Ecuador	1	Poland	1
France	1	Russian Federation	1
Hong Kong	1	South Africa	2
India	13	Spain	1
Ireland	1	Sweden	1
Israel	1	Switzerland	1
Jamaica	1	U.K.	1
Japan	1	United States	85
Korea, Republic of	1		

SGMM in the press

Smart Grid Today

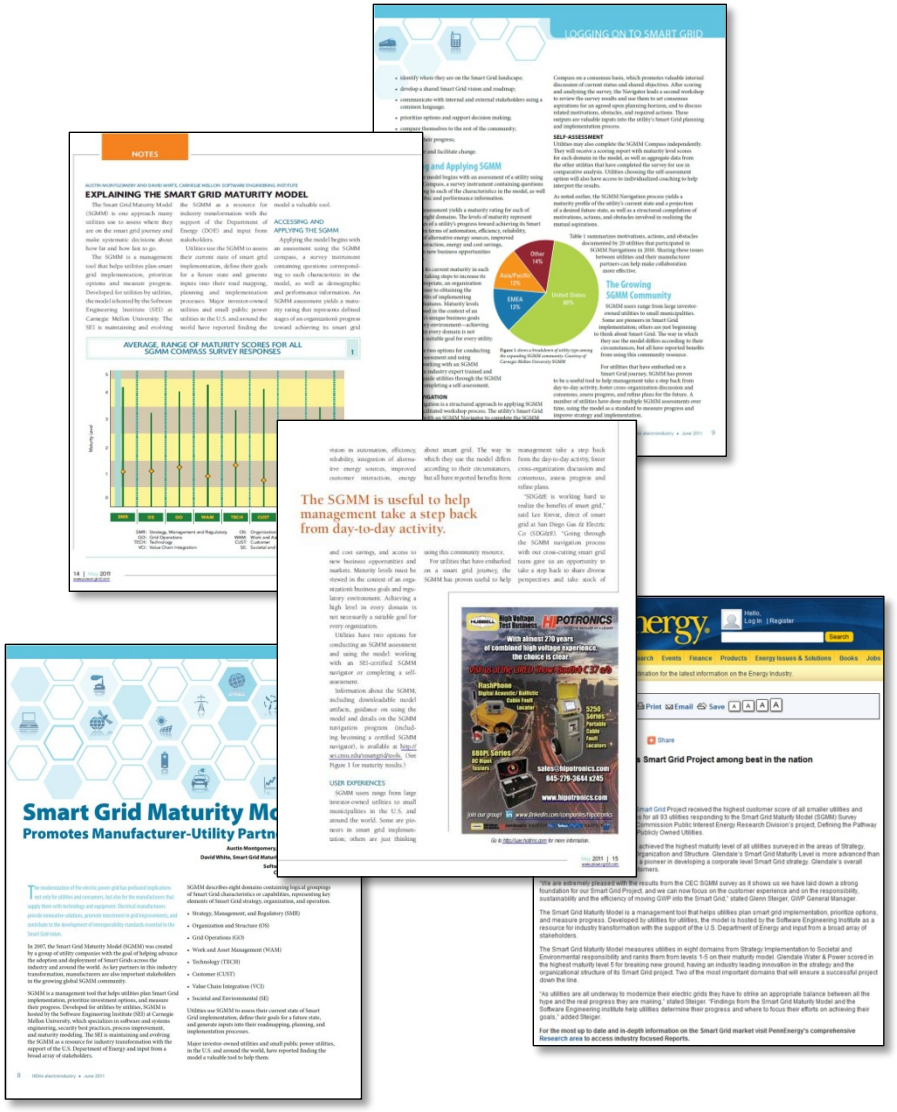
PennEnergy

electro industry

NEMA The Association of Electrical and Medical Imaging Equipment Manufacturers ■ www.nema.org ■ April 2011 ■ Vol. 16 No. 4

POWERGRID INTERNATIONAL

THE POWER DELIVERY MEDIA SOURCE



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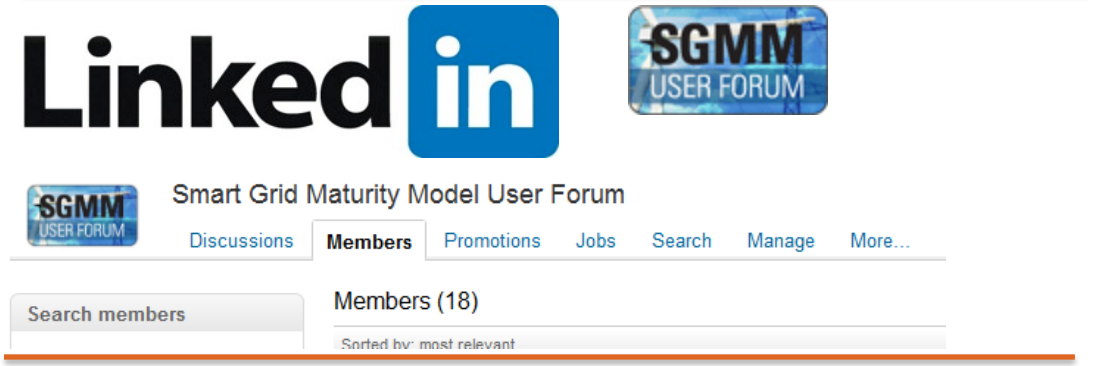
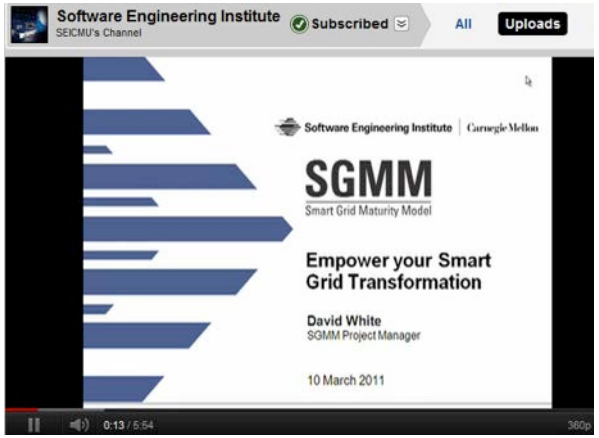
Smart Grid Maturity Model

Social Media

Plug in and Get Connected to the SGMM

@SGMM_Navigator





SEI | CMU

SGMM webinars

1:20 - 2:05

Smart Grid Maturity Model: A Vision for the Future of Smart Grid

The smart grid represents a whole new framework for improved management of electricity generation, transmission, and distribution. A reliable, secure energy supply is vital to our economy, our security, and our well being. With the support of the U.S. Department of Energy, the SEI is ...

read the full abstract and meet the presenter +

David White

http://resources.sei.cmu.edu/library/asset-view.cfm?assetid=21502

The Age of the Smart Grid is Here
Smart Grid Maturity Model Offers Best Practices for Utilities Worldwide

Software Engineering Institute
Carnegie Mellon University

IBM Corporation

World Energy Council

March 30, 2009

Software Engineering Institute | Carnegie Mellon

http://resources.sei.cmu.edu/library/asset-view.cfm?assetid=18614

Software Engineering Institute | Carnegie Mellon

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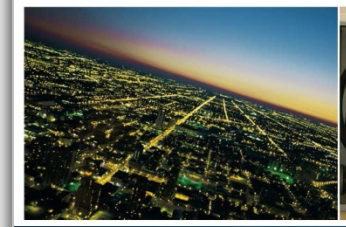
Smart Grid Maturity Model

Empower your Smart Grid Transformation

David White
SGMM Project Manager

10 March 2011

http://resources.sei.cmu.edu/library/asset-view.cfm?assetid=21966



Smart Grid Maturity Model Webinar:
Defining the Pathway to the California Smart Grid of 2020, for Publicly Owned Utilities

Steve Rupp, SAIC

March 21, 2012

SAIC

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The Smart Grid Maturity Model Around the World

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Overall lessons learned

Need better methods to conduct requirements analysis

We didn’t gather usable historical data

Stickiness – worked great on this project, but team members didn’t transfer approach to other projects

Quality was a “journey”

The project produced two complete versions of the product suite with the same budget that was used to produce one document prior to the adoption of TSP

Overall…

Zero depth entry enabled synchronized team

Photo: temple.edu

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Notices

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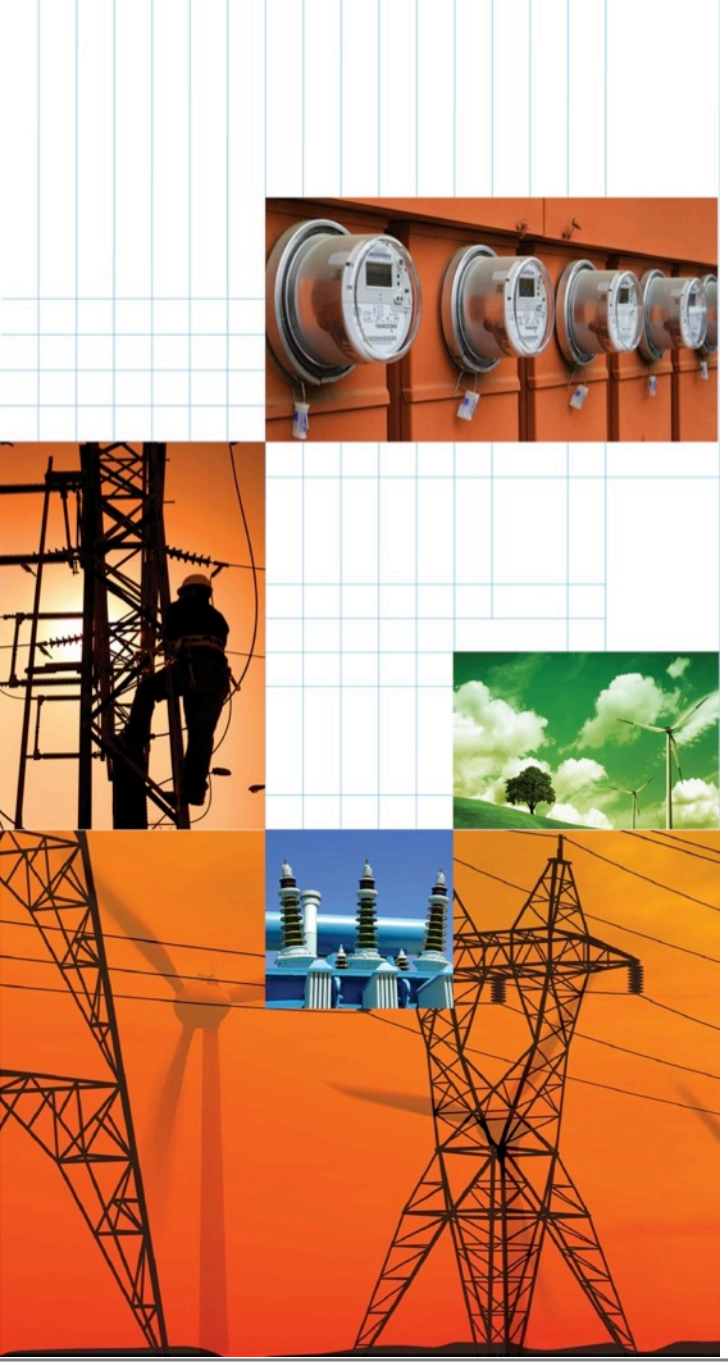


A major power grid transformation is underway

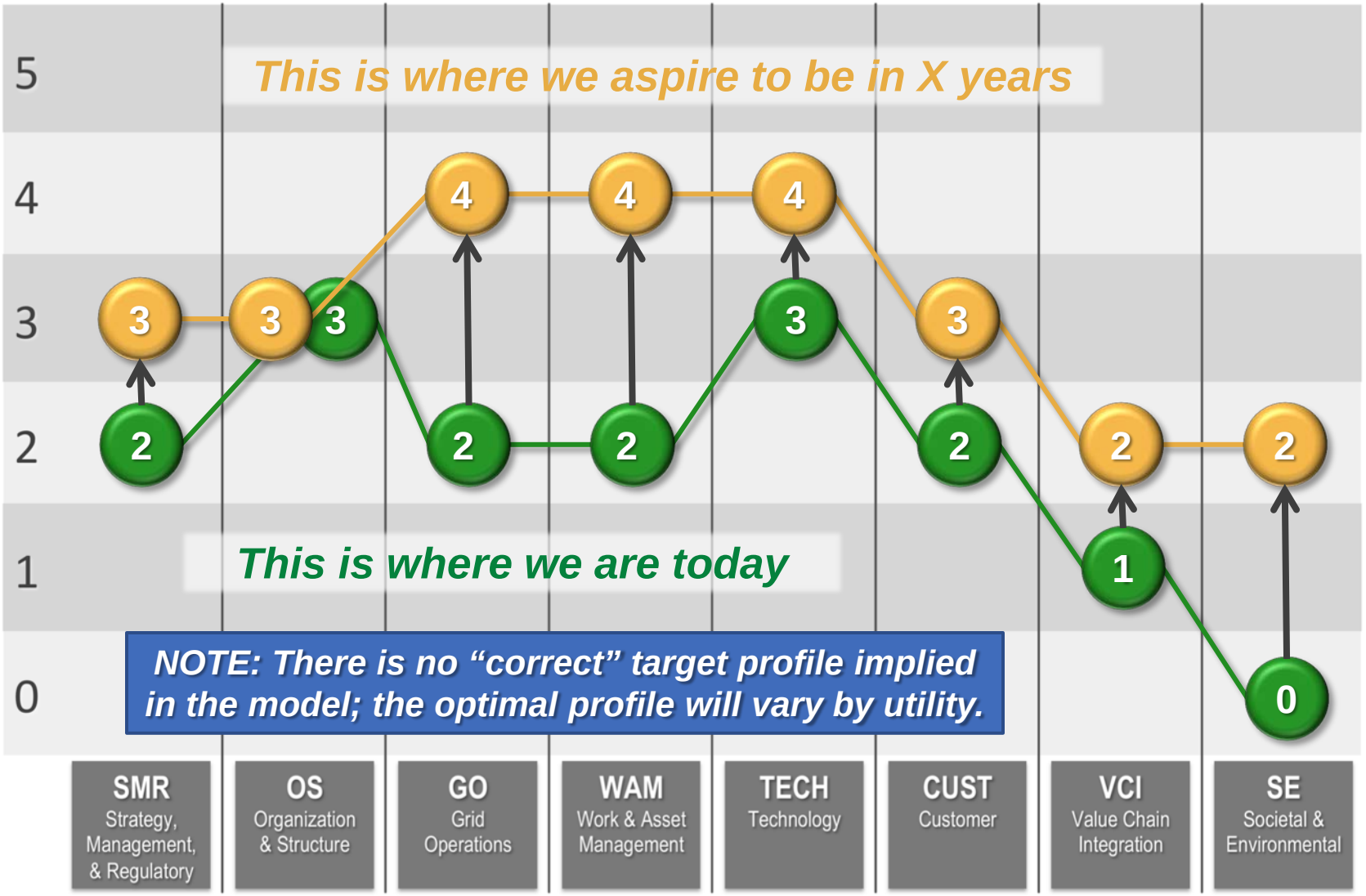
How can utilities

- Develop effective roadmaps?
- Track progress?
- Understand their posture in comparison to peers?

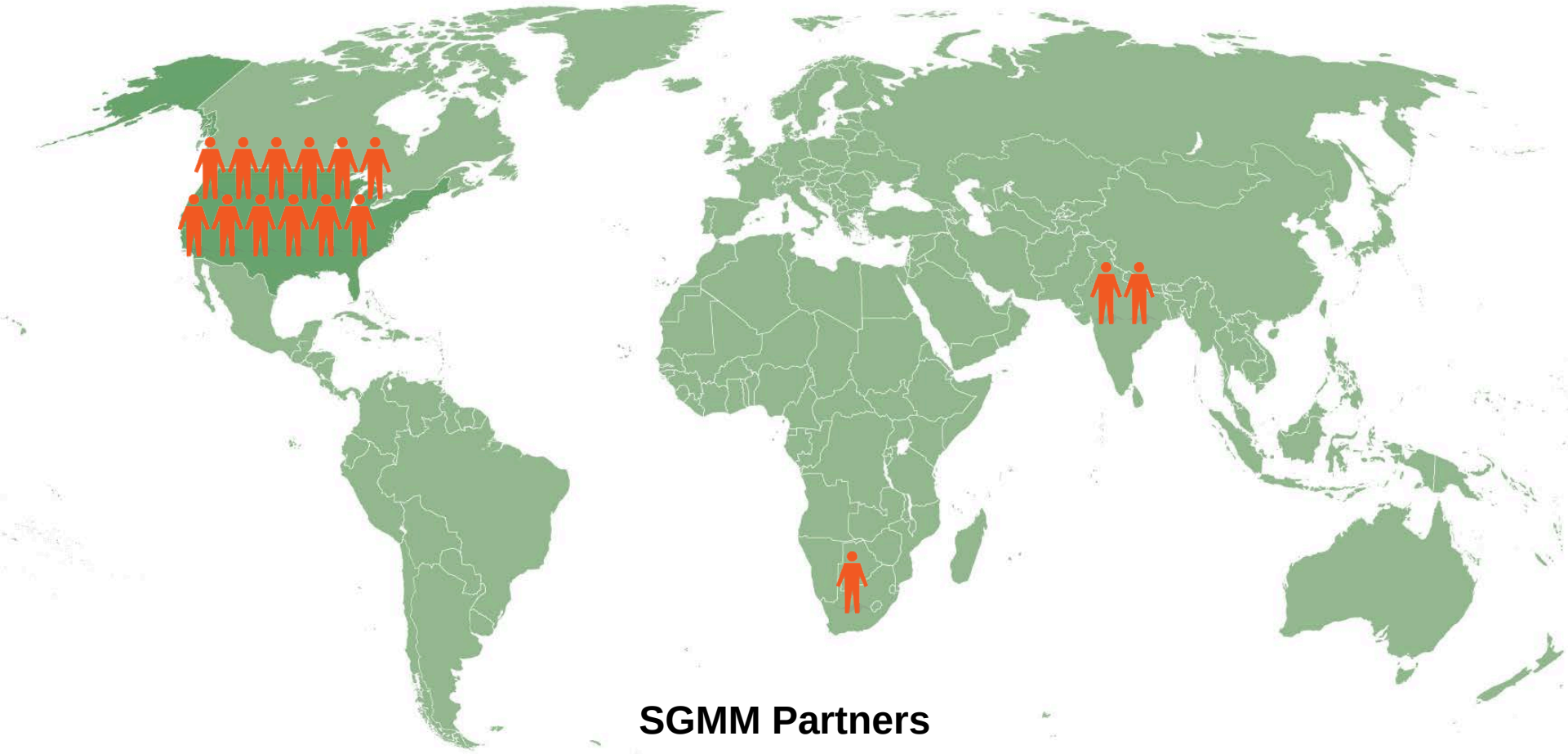
The Smart Grid Maturity Model was developed by utilities to address these concerns

Navigation results: consensus aspirations

example results



SGMM Partner population



SGMM Partners

12 USA, 2 India, 1 South Africa

SGMM History – 142 utilities, 29 countries, 157 submissions

AES Electropaulo
Alameda Municipal Power
Allegheny Power
Alliander
Ameren Illinois
Ameren Missouri
American Electric Power
APCPDCL
ATCO Electric
ATCO Gas
Ausnet
Austin Energy
AZUSA Light and Water
BC Hydro
BESCOM
Bonneville Power Admin.
BSES-Rajdhani
BSES Yamuna Power Limited
Burbank Water and Power
CELPE
CenterPoint Energy
Centro Sur
CESC Limited
CESC, Mysore
CFE (Mexico) Gulfonorte
CFE (Mexico) Jalisco
CFE (Mexico) Peninsular
Chelan County PUD
CitiPower and Powercor Australia Ltd
City of Anaheim
City of Columbus
City of Danville
City of Dover
City of Hamilton
City of Hudson
City of Jackson
City of Napoleon
City of Painesville
City of Palo Alto
City of Piqua Power System
City of Riverside Public Utilities
City of Wapakoneta
City of Westerville
CLP Power
Coldwater Board of Public Utilities
Comisión Federal de Electricidad-Corporativo
Country Energy
CPFL Paulista
Dhofar Power Company S.A.O.C.
Dominion Virginia Power
DONG Energy Sales & Distribution A/S
DPSC Limited
DTE Energy
Duke Energy
Eandis
East Miss EPA
EDF Energy Networks Branch
EDP - Energias do Brasil, S.A.
EnergyAustralia
Enexis
Entergy
EPCOR Distribution & Transmission
Ephrata Borough
ERDF
ESB Networks
Eskom Holdings SOC Limited
eThekwini Municipality, Electricity Unit
Exelon/ComEd
Exelon/PECO Energy
FirstEnergy
Fortum
Glendale Water & Power
Guandong Power Co.
Holland Board of Public Works
Hydro One
Hydro One - Distribution
Hydro Ottawa Limited
IEC
Imperial Irrigation District
Integral Energy
Intergys
Jamaica Public Service Company
KEPCO
Los Angeles Department of Water and Power
Majan Electricity Company S.A.O.C.
Manila Electric Company
Manitoba Hydro - T&D
Marietta Board of Lights and Water
Mazoon Electricity Company
Memphis Light, Gas and Water Division
MSEDCL
Muscat Electricity Distribution Company S.A.O.C
Muscatine Power & Water
Nashville Electric Service
NB Power
NDPL
Noida Power Company Limited
Oberlin Municipal Light & Power System
Oman Electricity Transmission Co.
Pasadena Water and Power
Pepco Holdings/PHI
PG&E
PGN Carolina
PGN Florida
PNM
Portland General Electric
PPL Electric Utilities
Princeton Electric Plant Board
Progress Energy
Puget Sound
Redding
Reliance Energy
Roseville Electric
Rural Areas Electricity Company
Sacramento Municipal Utility District
Salt River Project
Santee Cooper
SCANA
SDG&E
SIG Geneva
Silicon Valley Power
SMEPC - International Cooperation Dept.
Snohomish
Southern Company
Tata Power
Tenaga Nasionale Berhad
Tokyo Electric Power Co.
Toronto Hydro Electric System Ltd.
Town of Front Royal
Tucson Electric Power
UGVCL
Unión Fenosa Distribución
Unison Networks Limited
Vattenfall Distribution
VELCO
Village of Carey, Ohio
Village of Clinton
Village of Oak Harbor
Village of Yellow Springs
Wadsworth Electric And Communications
Wyandotte Municipal Service
Xcel Energy
Yantarenergo
Zhejiang Jiaxing Electric Power Bureau

Color chart

Green
Utility as-is
R=4, G=129, B=60

Gold
Utility to-be
R=231, G=172, B=67

Blue
Full Community
R=64, G=108, B=187

Orange
Peer Community
R=222, G=102, B=33